DOCUMENT RESUME

ED 277 364 IR 012 471

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TITLE Use of Microcomputers in Leicestershire Schools.
INSTITUTION Leicester Univ., (England). Primary Communications Research Centre.
SPONS AGENCY British Library, London (England). Research and Development Dept.
PUB DATE 86
NOTE 37p.
PUB TYPE Reports - Research/Technical (143) -- Tests/Evaluation Instruments (160)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Computer Assisted Instruction; Computer Literacy; Curriculum Development; *Elementary School Curriculum; Elementary Secondary Education; Foreign Countries; Mathematics Instruction; School Surveys; Science Education; *Secondary School Curriculum; Sex Differences; Student Attitudes; *Use Studies
IDENTIFIERS *Leicestershire County Schools (England)

ABSTRACT

This report presents the results of a survey conducted among all primary and secondary schools in Leicestershire (England) in 1985 to examine the role of microcomputers in schools, and the extent to which their introduction had led to a shift in teaching emphasis toward providing more skill-based curricula (i.e., study skills for life) rather than content-based curricula (i.e., knowledge for life). It was anticipated that primary schools would provide more scope for investigating computer applications for information handling, while secondary schools would use more subject-oriented computer applications, especially in math and science. Results from 300 of the 424 potential respondents showed that effects on curriculum development are likely to be gradual, and the information role of microcomputers was significantly underdeveloped in primary schools because of insufficient facilities and arrangements for staff training. Little evidence of gender bias operating against female pupils was detected by male or female teachers, particularly in primary schools. In secondary schools, however, it was clear that microcomputers were very much the preserve of mathematics, science, and computer studies departments. This factor, coupled with a 4:1 ratio of male to female secondary teachers of computing may have some negative effects upon the degree to which female pupils are likely to maintain and develop computer literacy skills. Supporting data and a sample questionnaire are appended. (DJR)

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ED277364

USE OF MICROCOMPUTERS IN LEICESTERSHIRE SCHOOLS

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Published by
Primary Communications Research Centre
University of Leicester
LEICESTER LE1 7RH

PCRC is supported by a grant from the British Library Research and Development Department.

Grateful acknowledgement is made to the Department of Education and Science which funded the initial phase of this work.

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ABOUT PCRC

The Primary Communications Research Centre was established at the University of Leicester in 1976 with a grant from the British Libarary (R&D) Department to act as a national focus for work in this field. The subject of primary communications covers all methods of disseminating research information, ranging from specialist journals and monographs to conferences and other informal methods. Staff at the Centre also carry out research (both large- and small-scale projects) into various factors affecting the dissemination process, and subject areas have included - humanities, sciences, social sciences, medicine, agriculture and technology. Reports of this research are published as projects are completed.

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Abstract

This report is based on a postal survey of 300 Leicestershire schools, the purpose of which was to examine the effects and implications to emerge from the introduction of microcomputers to the primary and secondary education sector. The original motivation for this survey was to establish whether the introduction of microcomputers had lead to any detectable shift in emphasis away from a "knowledge for life" approach towards the development of "study skills for life". Computer-based information provision has assumed significant importance - particularly in the library and information community - and the extent to which new entrants to the profession will have attained a greater degree of computer literacy skills may depend to a large degree on the exposure, training and attitudes fostered in the classroom.

Results show that effects on curriculum development are likely to be gradual - particularly in primary schools. Insufficient facilities and arrangements for staff training served to exacerbate this position. There is evidence to show that innovative educational applications of new technology are often a product of the teacher's personal expertise and enthusiasm. There is also poor co-operation between schools in sharing and co-ordinating their respective computing strengths where these are clearly of common concern.

Little evidence of a gender bias operating against female pupils was detected by male or female respondents (teaching staff). This was particularly true of primary schools. In secondary schools, however, it was clear that the microcomputer was still very much the preserve of mathematics, science and computer studies departments. This factor, coupled with a 4:1 ratio of male to female secondary teachers of computing in Leicestershire may have some deleterious effects upon the degree to which female pupils are likely to maintain and develop computer literacy skills.

The information role of microcomputers was significantly underdeveloped, particularly where it involved contact with the school library. Primary schools were especially handicapped by constraints of insufficient space and equipment. Micro-based applications such as computer-aided learning and database work featured high in the league of teachers' preferences for future development.

Introduction

This report presents the results of an extensive postal survey conducted among all primary and secondary schools in Leicestershire during the course of 1985. The questionnaire on which this work is based originated as an initial element in a doctoral research programme undertaken by Howard Fidderman in conjunction with the Primary Communications Research Centre at Leicester University. The purpose of the survey was to examine the role of microcomputers in schools, and the extent to which their introduction had resulted in any detectable shift in teaching emphasis towards providing "study skills for life" rather than "knowledge for life". In effect, a movement away from content-based curricula to those which are skill-based.

At the outset it was anticipated that primary schools might provide more scope for exploring computer-orientated applications associated with information handling skills. Traditionally, primary schools, in particular, have seen the development of skills, ideas and attitudes as their main concern. Secondary schools, by contrast, are often characterised as providing a more rigidly subject-orientated approach to the use of computers - with a bias towards mathematics and science subjects.

Particularly close attention was paid to the length of time teaching staff had been involved in using computers in the classroom, and the extent to which their experience was informed by extramural activities, or indeed any contact with computing outside the school itself. Gender distribution of staff responsible for teaching computing, and their perceptions of male and female pupils' attitudes to acquiring computer literacy skills were also investigated. (As a significant proportion of the library and information profession is female, it was considered relevant to explore gender/technology relationships where these could be identified - if only in terms of establishing the ratio of male to female heads of computing.)

Additional observations of low statistical significance but high interest value are given in the appendices at the end of the report.

THE QUESTIONNAIRE

Data presented here derive entirely from the results of a postal survey conducted during the period April - August 1985. A questionnaire was sent to all Leicestershire schools, representing a total of 424 potential respondents, of which 300 replies were received, giving an overall response rate of 70.8%. It will be seen, however, that returns from primary schools predominated. The form and approach of the final questionnaire was designed on the basis of an earlier pilot survey involving a sample of nine Leicestershire schools undertaken during February/March of 1985. Preliminary results obtained from this exercise enabled development of a simplified and more concise questionnaire format for use in the main survey (see Appendix C).

1. RESPONSE RATE/CHARACTERISTICS OF SCHOOLS SURVEYED

Difficulties were encountered in classifying some respondents by school category. Those surveyed are expressed here as primary schools (infant, junior and both infant and junior); high schools (including middle schools); and upper schools. High/middle schools were taken to represent post-primary but pre- "O" level; upper schools were those with "O" level pupils. The overall response rate by category is given in Table 1 below. Table 2 shows the the relative proportion of total responses received by school category.

Table 1 Overall reponse rate by category

Category	Response (%)	Actual returns
Primary	74.1	249 (of 336 dispatched)
High/middle	62.2	23 (of 37 dispatched)
Upper	54.9	28 (of 51 dispatched)

Table 2 Proportion of total responses received by school category

Category	Proportion of total responses (%)
Primary	83.0
High/middle	7.7
Upper	9.3

It will be seen from Table 2 that any simple statement of figures will be heavily biased towards primary schools. In making comparisons between types of school, high and upper schools, unless otherwise stated, are grouped together and considered as "post-primary" or "secondary" schools.

2. COMPUTING STAFF

(a) Gender

Of the total number of respondents it was found that 58% of teachers responsible for computing were male, 38% female, and in 4% of cases the post was shared - often between male and female teachers. This difference was not, however, evenly distributed across different school categories. In secondary schools there were significantly more male than female teachers in charge of computing, exhibiting a ratio of 4:1. All shared posts were located in primary schools, where there was also a proportionately greater number of female teachers in charge of computing. The latter trend was also evident in respect of the gender of head teachers - primary schools having a greater than average number of female head teachers by comparison with secondary schools (see Appendix B).

(b) Gender differences noted by teachers

Of the 94% of teachers who replied to the question dealing with perceived differences in interest and use of micros between boys and girls, 71% stated that they had not noticed any such differences; 20% stated simply that that they had noticed a difference; and 9% stated that they had noticed a difference, but qualified their answer by saying that things were now improving, or that the difference was only an apparent one. Of the 81 teachers who noted some difference between the sexes, only one teacher felt that boys displayed more ability in their use of micros. A further breakdown of teachers' observations is given in Table 3.

Table 3 Perceived differences in gender attitudes to micros observed by teachers

Response (%)	Actual Nos	Observations
57	46	Felt that boys were more enthusiastic and more confident with micros than girls
21	17	Merely noted some relatively neutral differences, e.g. that more boys came to the computer club, or that boys seemed to prefer games, whereas girls preferred more "serious" educational applications
14	11	Stated that the difference was that boys were pushy and tended to inhibit girls in the classroom use of micros
7	6	Did not state the type of difference noted
5	4	Felt that girls were more creative and and used more original thought when using micros

A considerably greater proportion of secondary school teachers reported noticing gender differences than primary teachers. This was also in line with the comments of a number of teachers who stated that gender differences in this connection were not noticeable in younger children, and only emerged at a later stage. Types of gender differences noted did not correlate with any particular school type.

There was no significant difference in the proportion of male and female computing heads who noticed gender differences, nor did the type of difference noted correlate with the gender of the computing head teacher.

(c) Proportion of teaching hours involving microcomputers

Only 3.4% of all respondents considered that "all" their teaching time was was devoted to using microcomputers (micros). Those who spent "most" of their teaching time using micros represented 5.1% of the total, whereas a majority of teachers (91.5%) stated that they spent only

"part" of their time working with micros. It was also evident that more primary teachers (who tend to teach a wide number of subjects) devoted only part of their time to working with micros. Secondary school teachers represented a greater than average number of those who spent all or most of their time on computing.

(d) Other subjects taught by teachers in charge of computing

The largest response in this category reflected the position of primary teachers, whose areas of responsibility, aside from computing itself, were commonly expressed as "all subjects" or "the whole curriculum". This response was given by 99% of primary heads of computing, representing 81% of all teachers. Of the other three primary teachers, two were identified as being associated with teaching children with special needs, and one with teaching humanities. Table 4 shows the situation in secondary schools, where there is a fairly clear bias towards heads of computing also being involved with teaching maths and science subjects.

Table 4 Other subjects taught by teachers in charge of computing at high and upper schools

Subject	Response as percentage of all teachers
Maths	8.4
Science subjects	3.6
Humanities	2.2 (none in upper schools)

The remaining 4.4% of respondents were identified as full-time teachers of computing.

(e) Length of experience of using micros in schools

Length of experience of heads of computing ranged from 1 - 7 years (mean value 2.6 years; median - and modal value - 2 years). As shown in Table 5, length of experience was not distributed evenly across school categories.

In primary schools 74% of heads of computing had only one or two years' experience of using micros in the classroom, while 82% of their counterparts in secondary schools had more than two years' experience.

Table 5 Length of experience by school category

Category	Experience/years (median)
Primary	2
High/middle	3
Upper	5

(f) Experience of using micros outside shool

Table 6 Use of micros by heads of computing outside school

Response (%)	Type of experience
21.6	Experience of home/hobby computing
7.6	Experience derived only from courses/ evening classes
7.6	Considerable experience (programming or teaching outside school)
1.7	A little experience only, e.g. games etc.

Levels of experience with micros outside the classroom displayed a marked variation. Of all heads of computing, 61.5% had no experience in this category whatsoever (this includes 2.7% who had experience of only mainframe computers). Most heads of computing in primary schools had no experience of micros outside school premises. Of the three main categories of schools examined it was in high schools that most extramural experience was to be found.

3. MICROCOMPUTERS IN THE CLASSROOM

(a) Numbers

Every school involved in the survey had at least one microcomputer (micro). The total number per school ranged from one to 37. The mean across all schools was 3.4 (median = 2), but, as shown in Table 7, this value showed a wide variation according to category.

Table 7 Number of micros by school category

Category	Mean	Median
Primary	1.66	1
High/middle	6.09	6
Upper	16.26	14

(b) Models

Two models emerged as the micros most commonly in use in both primary and secondary schools; namely the BBC B and RML 380Z or 480Z. Only 3% of the schools surveyed had no BBC B machines and these were exclusively primary schools who owned RML 380Z or 480Z micros. Overall, 85% of all school micros in Leicestershire were of the BBC B variety. Their distribution by school type is shown in Table 8.

Table 8 Percentage (or proportion) of BBC B micros in each school category

Category	Distribution (%)	Mean No.
Primary	93.4	1.55
High/middle	75.0	4.57
Upper	81.8	3.30

Only 20% of all schools owned RML machines, of which the RML 380Z was the most common, representing 9% of the entire school micro population. Table 9 shows ownership of this particular model to be concentrated in secondary schools.

Table 9 RML ownership by school category

Category	Ownership as % of school micro population
Primary	3.4
High/middle	17.8
Upper	12.3

(c) Other types of micro currently in use

Possession of models other than the BBC B and RML machines accounted for 6% of the total school micro population and was restricted to only 10% of schools in the survey.

Table 10 Ownership of micros other than BBC/RML machines

Category	Ownership as % of total population
Primary	3.6
High/middle	14.3
Upper	5.9

In descending order of frequency other models recorded as being in current use were as follows:

Spectrum
ZX 81
TRS-80
Oric Atmos
Commodore PET
Atari 400
Dragon
Atari 600XL
Commodore VIC 20
Apple II
Electron
Tandy II

(d) Location

It was found that 19% of schools housed at least some of their micros in a special "computing room". Locating micros in an ordinary room - usually a classroom - accounted for 15% of all schools, and 9% housed some in the science laboratory. The remainder accounted for micros that were moved from room to room as necessary. It was found that 82% of secondary schools had adopted the use of special computer rooms or science labs for this purpose, compared with only 6% of primary schools.

(e) Mobility

Following from the above observations it was recorded that almost half (47%) of secondary schools did not provide mobile computing facilities, whereas in primary schools this figure was 19%. Overall, in 66% of schools all micros (including cases where "all" equals one) were recorded as capable of being moved between classrooms; 76% had some provision for mobility; and 24% had no movable micros whatsoever.

(f) Purchasing policy

Of the total number of questionnaires returned 84% provided reasons for the acquisition of a particular micro. These results are recorded in Table 11. (Note that the percentage figures total more than 100. This is because in several instances teachers gave more than one reason affecting their purchasing policy.)

Table 11 Reasons for purchasing a school micro

% of those giving a reason/giving a response	
31	Acted on advice, e.g. purchase was recommended as part of LEA or county policy. (This reason applied in the case of BBC/RML micros in particular.)
28	Micro was donated or provided by DES or LEA so no active decision had to be made. (Many schools had received RML machines by this route.)
20	Compatibility was required with existing hard/ software and/or with experience of teaching staff. (Some teachers expressed a desire to network micros, necessitating hardware compatibility.)
19	Availability of good software and/or good hardware "add-ons".
16	Purchase was grant-funded - usually by DES or DOI.
13	Model best suited to meeting criteria for particular applications.
12	High performance-price ratio/low cost.
4	Ease of use/simplicity.

When compared across schools by category, primary teachers gave "donation/issue of micro by DES or LEA" as the reason for acquiring a particular model of microcomputer on a grater than average number of occasions when compared with teachers in secondary schools. They also gave "suitability to fit criteria for a particular application" on a lower than average number of occasions.

4. USE OF MICROCOMPUTERS IN SCHOOLS

(a) Subject areas

The use of micros for teaching English and mathematics was recorded by all respondents. In primary schools micros were used especially for developing language skills, such as reading and writing, in addition to supporting "topic work". The proportion of respondents that mentioned other subjects is given in Table 12.

Table 12 Use of micros for teaching (subjects other than English and mathematics)*

Proportion (%)	Subjects recorded
18	All areas of the curriculum
16	Computing studies - awareness/appreciation
15	Science (including geography)
12	Humanities/social studies
8	Remedial/special needs
7	Art and design

(* In addition, five schools were using micros for music teaching and a further four in association with the teaching of physical education.)

As might be expected, primary schools were significantly more involved with using micros across the curriculum, whereas the converse was true of secondary schools, where the use of micros was significantly more subject-orientated. Table 13 gives the percentage of all schools by category for the following subjects:

Table 13 Use of micros by subject/school category

Subject	Primary (%)	High/middle (%)	Upper (%)
Across curriculum	25.0	0	0
Computing	7.1	50	96
Science	6.4	58	95
Humanities	5.5	63	57
Remedial	2.8	47	48
Art/design	4.1	26	38

(b) General skills

In this category 40% of respondents made reference to skills which teachers felt micros were being used to develop, of which 45% cited skills associated with logic and reasoning, and 28% specifically mentioned problem solving. (Both these areas were restricted exclusively to primary schools.) Other skills are given in Table 14.

Table 14 Use of micros for teaching general skills

% of those responding	Skills
20	Word processing
18	Data handling
13	Simulation
7	Group decision making
7	Keyboard skills
5	Information retrieval
4	Data collection

Communication skills, memory, social, creative and visual discrimination skills were also mentioned by respondents. The majority of skills referred to in Table 14 were almost exclusively restricted to primary schools, with the exception of word processing and information retrieval, which elicited a disproportionately high response from among secondary schools. (In overall terms there was no significant difference across school categories in recording the use of micros for teaching general skills.)

(c) Information handling skills

In only 35% of cases did teachers feel that micros were being used for information handling purposes (this excludes the 6% of schools in which a micro was being used for storing school records, timetabling, exam entries etc.). The figure also excludes a further 25% of schools involved in the Domesday project, which involves information handling using a microcomputer. Table 15 gives a breakdown of the 35% of schools making a response in this category.

Table 15 Use of micros for information handling

% of those responding	Applications
74	Databases set up and accessed by pupils (often using "Quest" or "Factfile" software)
9	Teletext or viewdata systems, e.g. "Edfax"
9	Access by pupils to databases, e.g. library catalogue, school notices etc. (i.e. databases other than those created by pupils themselves)
11	Unspecified

(d) Use of computer games

The use of micro-based computer games proved a difficult area to survey, as one person's games is another's educational program. Table 16 indicates that access to computer games appears closely controlled. It was also apparent that primary schools made greater use than average of game-based software. (Percentages total more than 100 as 8% of schools used micros for both educational and recreational games.)

Table 16 Use of micro-based computer games

Response (%)	Replies
21	"No" - some replies were very emphatic
71	Educational games permitted. e.g. "Granny's Garden", "Flowers of Crystal" etc.
12	Recreational games permitted, e.g. "Space Invaders" - usually only at after school computer clubs and during "wet lunch hours"
4	Games permitted - but type unspecified

(h) Micros and the school library

Of the 91% response to this question, 89% of replies stated that micros were not currently used in the school library, although 12% felt that this type of activity was a possibility for the future. Reasons advanced for not using micros included "no spare micros", "library too small" or "no library". Of the remaining 30 schools using micros in the library, applications were seen to fall into three principal groups (see Table 17).

Table 17 Use of micros in the school library

No. of schools	% of those responding	Applications
11	37	Micro used for cataloguing stock or for controlling circulation
12	40	Micro used for connecting to external networks or for in-school information centre
7	23	Library involved in minimal way, e.g. as a computer teaching area or held books on computing

Use of micros in primary school libraries was less than the average recorded across all school categories.

5. JOINT COMPUTING VENTURES OUTSIDE SCHOOL

(a) None of the primary schools in the survey subscribed to either the Times Network or Educational Prestel. All but one of those involved with other schemes were primary schools, e.g. MAPE. Table 18 shows the Domesday project to be the most common example of a national co-operative computing venture, with 50% of all schools recording participation. (One teacher remarked, however, that in his/her view the project had been "too rushed and poorly administered".)

Table 18 Involvement with national/local networks

Response (%)	Activity
50	Domesday project
3	Times Network
2.4	Educational Prestel
3	About to join one of the above networks
4	Involved in some other computing venture, e.g. MAPE, Brighton Telesoft etc.

(b) Inter-school co-operation

Of all schools questioned, 65% were not at present co-operating with other schools in the area of microcomputing: 3% hoped to initiate co-operative schemes in the near future and 2.5% has already dropped their attempts, due largely to hardware incompatibilities or to other schools being at "different stages of development". Only one school was co-operating to the extent of adopting a common purchasing policy. One other (primary) school transferred administrative information in the form of floppy disks as part of its "feeder" role to the local secondary school. Table 19 provides an indication of areas of co-operation identified in the survey. It was observed that, as a whole, primary schools appeared less likely to be involved in inter-school co-operation than secondary schools, where 30% of respondents had attended meetings in this connection, as against a figure of only 8% in the case of primary teachers. It was also noted that of the 49 schools providing an indication of with whom they co-operated, 69% did not participate with schools of their own level; i.e. primary schools co-operated with high schools, and upper schools with primary schools etc. This type of co-operation tended to be of an informal nature, unrelated in the main to any primary feeder role. What did emerge was a distinct lack of co-operation between schools of the same level.

Table 19 Inter-school co-operation

Response (%)	Activity
13	Meetings (only half of which were on a regular basis)
11	Co-operation unspecified
3	Discussion of software
2	Giving/taking advice
2	Exchanging software (this does not necessarily suggest "pirating", as many schools write their own programs)
2	Secondment of pupils - usually the "loan" of secondary pupils to assist with teaching computing in primary schools
2	Sharing hardware/running joint courses

6. THE SCHOOL LIBRARY

Teachers were asked about their plans for introducing micros into school libraries in the future - 80% of whom had no so such plans. (This is not inconsistent with only 12% of schools having some future plans, referred to in Section 4, as some school libraries were already using micros but were intending to extend the scope of their application.)

A desire to see the introduction of computerised library catalogues was expressed by 12% of teachers, and 11% wished to set up some form of computerised database or information centre within school libraries. As has been shown in relation to the actual use of micros, primary schools were also significantly less likely to have future plans for introducing them into the library. Where such plans existed they were often restricted to the catalogue or stock record. Secondary schools, on the other hand, were significantly more interested in planning an extended role for micros in libraries based around the concept of information centres geared towards the perceived requirements of pupils as well as staff.

7. SCHOOL POLICY

(a) Teacher training

A total of 59% (177) schools reported on the type of training currently available to staff wishing to use micros in the classroom. Table 20 gives a breakdown of these responses.

Table 20 Teacher training

% of those responding	Methods employed
30	County or LEA training schemes alone, e.g. local computer skills training centre
28	In-service training alone (on premises)
16	"Ad-hoc" training, e.g. after school meetings or "learning-by-doing"
14	Combination of county/LEA and in-school training
12	Combination of formal LEA/in-school training and ad-hoc arrangements

(b) School policy on staff training

Only 23% of schools gave an indication of the existence of any active form of staff training policy. Of these, 70% actually encouraged staff to attend training courses - the remaining 30% left the decision whether or not to take up such opportunities to the individual teacher.

(c) Rethinking the curriculum

Teachers were asked to indicate the extent to which the introduction of microcomputers had led to a rethinking of the curriculum (see Table 21 for breakdown of responses).

Table 21 Perceived effects of micros on the curriculum

Response (%)	Comments
31	No change
17	Just beginning to rethink/make changes
32	Little or very little change - most respondents giving this answer spoke in terms of micros changing teaching methods and classroom management
14	Some changes planned
6	Particular areas had changed a great deal

Examples of areas reported as exhibiting the most marked changes are given below in order of descending frequency :

topic/project work (primary schools only)
mathematics
remedial teaching
* design
* English language (primary schools only)
logic (primary schools only)
* science
* word processing
* humanities
business studies

(* Secondary schools represented considerably above average frequencies in these areas - although at too low a level to be statistically significant.)

Overall, a greater than average amount of change in the curriculum was perceived by teachers in secondary schools.

(c) Addition of computing as a curriculum subject

In 16% of schools some specific computing subject had been added to the curriculum. This was typically called "computer studies" or "computer science" in secondary schools and "computer familiarisation" in primary schools. The proportion of schools recording the inclusion of computing into the curriculum is given by category in Table 22.

Table 22 Introduction of computing to the curriculum

Category	Proportion (%)
Primary	7.1
High/middle	50
Upper	96

Other indications of school policy may be seen in earlier sections dealing with purchasing policy, involvement of school libraries and inter-school co-operation.

8. FINANCE

Although 273 schools provided information in this section of the questionnaire, representing a response rate of 91%, the expression "financial assistance" was clearly open to a variety of interpretations. For example, some schools would include finance from LEAs and capitation in this category, whereas others would not regard this as "assistance", citing instead sources of revenue or equipment provided by the school fund or Parent Teacher Associations (PTAs). Consequently the figures provided under this category serve only as a general guide and are expressed as a percentage of the total response rate given above.

(a) Hardware

Over 80% of schools received some form of financial assistance for the provision of computer hardware. The role of the DES and local PTAs was particularly evident, many respondents regarding this as a "speciality" area where these agencies were concerned. A breakdown of reported sources of financial assistance is given in Table 23. (Percentages total more than 100 because some schools received financial help from more then one source.)

Two schools received financial assistance from a community college and a further two from their local university. One other school was assisted by a local company.

(b) Software

In general terms it was found that schools received less support for the purchase of software than hardware. In particular, LEAs and PTAs were observed to play a less prominent role in this area - as demonstrated by Table 24.

Table 23 Sources of financial assistance for hardware purchase

Response (%)	Source
18	No assistance
40	Some assistance from PTA
29	Some assistance from LEA
19	Capitation
19	DES funding (usually only for first micro)
8	School funds
3.3	Private funds
2.5	TVEI (Technical/Vocational Education Initiative)

Table 24 Sources of financial assistance for software purchase

Response (%)	Source
30	No assistance
36	Capitation
18	Some assistance from LEA
16	Some assistance from PTA
10	School funds
2.5	TVEI
2.2	Private funds

The same two schools received assistance from the DES and two different schools (see above) received help from community colleges. In one instance financial support was again provided by a local company.

(c) Running costs

Possibly because this item represents hidden costs it is regarded as a less glamorous item of expenditure than the purchase of hardware and software. It can be seen from Table 25 that this area attracted least in terms of financial aid.

Table 25 Sources of financial assistance towards running costs

Response (%)	Source
59	No assistance
20	Capitation
13	Some assistance from LEA
7.4	School funds
3.3	Some assistance from PTA
1.1	Private funds

TVEI funds were available to two schools and a community college provided assistance to one school. Other "hidden costs" were insurance and the purchase of books . Only 11 schools provided information in this category: four were assisted by their local PTAs, five used their capitation budget one used school funds and one received support from a local university.

(d) Training costs

It was clear that in the area of training LEAs had a major role to play in funding in-service training and providing supply cover for staff on courses. In two instances the PTAs were recorded as having given financial assistance. TVEI, a local university and private funds were also cited as sources of funding by one school in each case.

Table 26 Sources of funding for staff training

Response (%)	Source
50	No assistance
42	Some assistance from LEA
4.5	Capitation
3.8	School funds

(e) Inter-school comparisons

In drawing comparisons between types of school, high and upper schools have been taken together as "secondary schools". However, in all cases a clear hierarchy emerged; namely, primary - high/middle - upper. Thus, for example, primary schools reported the greatest proportion of LEA support for the purchase of hardware, upper schools reported the least and the proportion of high schools was about average.

(i) LEAs: Primary schools received LEA funding for hardware, software and running costs (but not for training) on a significantly greater proportion of occurrences than secondary schools.

(ii) PTAs: Primary schools received PTA assistance for purchasing hardware (but in no other category) on a significantly greater proportion of occurrences than secondary schools.

(iii) Capitation: Secondary schools used their capitation budget for purchasing hardware, software and contributing to running costs (but not training) in a significantly greater proportion than was found to exist in primary schools.

(iv) Other sources of financial assistance: TVEI grants went only to upper schools. No significant differences were observed in the distribution of financial support from the DES, private funds, community colleges or any of the other sources not already mentioned.

9. THE FUTURE ROLE OF MICROCOMPUTERS

Teachers were asked to indicate how they saw the role of micros in the future. The most frequent response was a wish to see micros integrated into the classroom as "another learning aid" (many respondents crossed out "just" in the questionnaire). Of the total responses in this section 68% of teachers were in favour of this role, with a significantly greater proportion

coming from primary schools compared with upper schools. Other types of applications mentioned in this context are given in Table 27. (Applications marked with an asterisk were not provided in the questionnaire.)

The only significant differences between teachers across school types were that in primary schools less significance was placed on applications associated with databases and computer-assisted learning.

(Other future uses for micros are mentioned in earlier sections dealing with school libraries, networks - joint ventures - school policy - changes in the curriculum.)

Table 27 Areas for future development

Response (%)	Application
57	Databases
34	Computer-aided learning (CAL)
27	Programming (mainly LOGO) - some teachers were very much against this with, as noted, the exception of LOGO
6	* Word processing
5	* Simulation/modelling
4	* Greater use of LOGO
3	* Greater emphasis on problem-solving skills
3	* Computer-aided manufacture and control
2	* School administration

Conclusions

While it would be imprudent to generalise unduly on the basis of this survey of Leicestershire schools, a number of issues emerged which it is not unreasonable to suppose may also apply at a national level. It is quite clear that the introduction of microcomputers in schools is no passing educational fancy: micros in the classroom are here to stay. There is also evidence to show that their use is beginning to have an effect on curriculum development. But these effects, more pronounced in secondary than primary schools, are likely to be gradual in the face of more basic and immediate problems associated with the technology itself, and the ability of teachers to assimilate new skills and adapt traditional methods to accommodate the growing importance placed on acquiring better standards of computer literacy. The picture to emerge from this survey shows many aspects which require urgent attention. The most obvious of which is the lack of a common policy approach to matters concerned with training and the development of a better awareness of the implications inherent in what is surely one of the most significant educational developments to emerge in recent years.

Computing in secondary schools appears, in teaching terms, to be a male preserve (in a ratio of 4:1), where the emphasis lies essentially in subject areas associated with mathematics, science and computer studies. By comparison with primary schools the secondary area is also better provided for as regards equipment and staff expertise. It was clear that as experience increased, teachers were likely to become more confident and innovative in their use of the technology. This also meant that they became more critical and demanding in their expectations of hardware and software performance. In this respect a number of interesting comments were offered: namely that some children take the teacher's standard of computer literacy as a measure of a teacher's worth. Teachers should be in a position to educate children about the weaknesses as well as the strengths of computers. These comments should also be seen in the context of a widely articulated demand for better educational software, better training and more time to develop personal computing skills.

There appeared to be little overt, detectable bias operating against female pupils in the use of microcomputers. Indeed it was noted that girls often made more original and imaginative use of their computing time. At least some appeared to prefer "serious" educational games to the "shoot 'em up" variety popular with boys. (It should be noted that access to the latter was, in the main, closely controlled.) The relatively few gender differences to be noticed were fairly innocuous; noting that boys rather than girls attended after-school micro clubs. This may explain other comments: namely that boys seemed more confident and displayed greater apparent enthusiasm for micro-based activities - though the latter difference dropped away as their novelty waned. Where attitudinal gender differences were noted, these usually occurred in secondary education.

In primary and secondary schools it was apparent that the acquisition of information handling skills is perhaps regarded as simply implicit in the general area of computer appreciation, rather than a separate and distinct area for development. The overall response rate for this category of activity was surprisingly low. Only 35% of respondents made reference to specific applications in this area. Of those that did respond, it was clear that databases emerged as being in greatest demand. Development of databases and computer-aided learning were seen as two of the main categories of micro applications most likely to be development for educational use in the future.

School libraries appeared to be something of a "cinderella", where the introduction of computing was concerned. A response rate of 91% in this category resulted in no less than 89% of returns indicating no current plans to involve the school library in the use of microcomputers. Reactions were expressed in terms of intention rather than practice: "something for the future". Reasons advanced for this varied between a lack of sufficient microcomputers to simply lack of space - or, in the case of some primary schools, the total absence of a school library as such.

In terms of funding provision it was clear that a common policy approach exists in relation to the purchase of hardware. The BBC B micro emerged as the virtual universal standard. Only in the case of high/middle schools did there emerge an element of choice, restricted in the main to RML machines (predominantly the 380Z). In spite of this apparent standardisation in hardware it was clear from the survey that little in the way of lateral co-operation existed between schools. In many instances this related to software incompatibilities and practical measures necessary to achieve effective levels of interaction. In some cases this problem was characterised as one of being at different stages of technical sophistication - which usually reflected varying levels of personal expertise exhibited by members of staff responsible for teaching computing or computer appreciation.

It was evident that LEAs play a major role where in-service training is concerned, whether in the provision of courses or in providing cover for staff who are able to take advantage of such opportunities. This was also true to an extent for the provision of hardware. Software, being less "visible" was purchased largely from the capitation grant. Running costs appeared the most neglected area - constituting an even less high profile, yet vital, item of recurrent expenditure. In the case of primary schools it is interesting to note the extent to which PTAs played a major part in equipment provision. The whole question of funding underpins many current problems with the introduction of micros in primary and secondary sector. Adequate levels of financial provision are a clear necessity, but without a planned developmental framework can only represent a partial solution. Energies at the present time ought to directed to making the best possible use of existing expertise through co-operation between schools at all levels - not least of all in an exchange of ideas and experience between schools at similar levels.

Appendix A

ANALYSIS OF RESULTS BY LENGTH OF TEACHING EXPERIENCE

The following section analyses significant differences in responses that arose between heads of computing with one or two years' experience of microcomputers in schools and heads of computing with more than two years' such experience. Only those variables which showed some significant difference in this dimension are mentioned below.

It should be stressed that the variable involved is NOT length of teaching experience, or even length of experience with microcomputers, but length of time that the teacher in charge of computing had been working with microcomputers in school.

EXPERIENCE OF MICROCOMPUTERS OUTSIDE SCHOOL

Those teachers who had had more than two years' experience with micros were significantly more likely to have experience of using micros outside school than those with only one or two years' experience (significant at 1% level).

NUMBER OF MICROCOMPUTERS IN SCHOOLS

The length of experience of working with microcomputers was positively correlated with the number of micros in a teacher's school. To some extent these figures can be explained because teachers with little experience tended to be in the primary schools, which had few computers, whereas teachers with more experience tended to be in the well-supplied secondary schools. However, this does not provide a complete reason for the observed correlation given in Table A1.

Table A1

Micro experience/ years	Number of micros in school
1	1
2	1
3	2
4	3
5	7
6	8
7	13

USE OF MICROCOMPUTERS IN SCHOOLS

(a) Specific subjects

Teachers with more than two years' experience mentioned the use of micros for teaching specific subjects much more often than teachers with less experience. However, this is only to be expected because specific subject uses of computers were largely confined to secondary schools where computing teachers had more experience. The figures were re-analysed, this time controlling for school type, after which no significant differences were found.

(b) Other subjects and skills

After controlling for school type, only two significant differences were found (both at 1% level). These were that, in primary schools, teachers with more than two years' experience stated that micros were being used in all areas of the curriculum and for information-handling purposes a greater than average number of times.

(c) The school library

Those with more experience were significantly more likely to be using a micro in the school library (at 1% level), but this difference disappeared after controlling for school type.

JOINT COMPUTING VENTURES OUTSIDE SCHOOL

Networks and national co-operation

After controlling for school type, the only significant difference to emerge was that in primary schools (but not in secondary schools) teachers with more than two years' experience were significantly more likely to be involved with the Domesday project than their less experienced colleagues (significant at 1% level).

(b) Inter-school co-operation

After controlling for school type, the only significant difference was again found in primary schools. This was that teachers with over two years' microcomputer experience stated that they were co-operating with other schools a significantly greater than expected number of times (significant at 5% level).

THE FUTURE USES OF MICROCOMPUTERS

Teachers with more than two years' experience felt that computers should be used for databases and for computer-aided learning a greater than expected number of times compared with their less experienced colleagues. After controlling for school type, this result was significant at the 1% level, but only in primary schools.

Appendix B

ANALYSIS OF RESULTS BY GENDER OF HEADS OF COMPUTING

Overall, 58% of teachers in charge of computing were male, 38% were female and in 4% of cases the post was shared - often between male and female members of staff.

As with the analysis of results by length of microcomputer experience, care must be taken with the interpretation of these figures because the much lower female:male ratio in secondary schools, when compared with primary schools, may explain much of the data. For example, most of the female teachers spent only part of their time working with computers, whereas male teachers often spent most or all of their teaching with micros. This could give rise to all kinds of interesting theories. However, after controlling for school type, and thus taking into account the relatively larger proportion of female teachers in primary schools (where teachers tend to spend less time with micros) any difference disappears.

(a) Gender of head teacher

There was a significant correlation between the head teacher and the head of computing being of the same sex. This occurred in over 70% of schools (a result significant at the 1% level). At least part of this significance may be explained because in a number of cases, particularly in primary schools, the head teacher and the head of computing were the same person.

(b) Teachers of computing

(i) Length of experience - The mean length of experience with micros in schools was 3.0 years for male and 2.2 years for female computing heads. A breakdown of average length of experience by school type is shown in Table B2.

Table B1 Length of experience/gender/school type

	Primary schools/years	Secondary schools/years
Male computing heads	2.6	3.9
Female computing heads	2.0	4.3

Because of the relatively small number of female computing heads in secondary schools, only the primary school figures have any statistical significance, and this is a trend seen throughout the analysis of these figures. Thus, it appears that any gender differences are more exaggerated in primary than in secondary schools.

(ii) Experience of microcomputers outside school - There were no significant differences in terms of whether or not the teacher had such experience, but the ratio of male:female teachers among those who had considerable experience was approximately 6:1 and the ratio of female:male teachers among those who had experience only from courses or evening classes was approximately 2:1.

THE MICROCOMPUTERS USED IN SCHOOLS

All correlation between gender of computing head and number of micros in a school can be explained in terms of school type, and the correlation is removed after controlling for school type. However, it should still be noted that female computing teachers are likely to have access to fewer micros than their male counterparts.

The issues of location of microcomputers and reasons for purchase showed no gender differences of any significance.

APPLICATIONS OF MICROCOMPUTERS IN SCHOOLS

A greater than expected number of male computing heads gave replies that micros were being used in the areas of humanities, science, remedial teaching and information handling purposes (significant at 1%, 2%, 3% and 5% levels respectively). However, all of these differences disappeared after subsequent analysis controlling for school type.

No significant differences were noted between the genders in the use of micros for games and in the school library.

JOINT COMPUTING VENTURES OUTSIDE SCHOOL

Twice as many male as female teachers of computing were involved with the Domesday project. After controlling for school type, male teachers were linked with the project in significantly greater proportion in both primary and secondary schools (significant at 1% and 4% levels respectively). The reasons for this difference were not clear.

No significant differences were found in the areas of inter-school co-operation, and present or future use of microcomputers in the school library.

SCHOOL POLICY

The only difference found here was that in schools in which county or LEA training was chosen there were a greater proportion of female head teachers than would be expected (significant at 2% level). No significant differences were found in the areas of changes to the curriculum and finance.

THE FUTURE USE OF MICROCOMPUTERS

After controlling for school type, the only differences found were that a greater than expected proportion of male computing heads in primary schools (but not in secondary schools) felt that micros should be used for databases and for computer-aided learning (significant at 1% level).

MICROCOMPUTERS IN LEICESTERSHIRE SCHOOLS QUESTIONNAIRE: To be completed by person i/c computing

Please return completed questionnaire to: Howard Fidderman, Primary Communications Research Centre, University of Leicester, Leicester LE1 7RH

(Please tick where appropriate)

SCHOOL

TYPE: PRIMARY ☐ HIGH ☐ UPPER ☐ HEADTEACHER Mr/Ms/Dr .....

PERSON I/C COMPUTING Mr/Ms/Dr .....

1. What proportion of your teaching hours involves work with microcomputers?

   PART ☐ MOST ☐ ALL ☐

2. If your answer to question (1) is not 'all', please list other subjects that you teach.

3. How long have you been working with micros in schools? YEARS ☐

4. Do you have any experience of microcomputers outside of school?

   If so, what?

5. Does your school have any policy in relation to the training of teachers for the use of microcomputers. If so, what?

6. Please state the number and types of microcomputers possessed by the school:

ACORN BBC 'B'	
RESEARCH MACHINES 3802	
OTHERS	

7. What were the reasons behind obtaining each particular type of micro?

8. Please state the number of micros that are mobile or housed in:

   A SPECIAL ROOM ☐ SCIENCE LABORATORIES ☐ OTHER ☐ MOBILE ☐

9. For what subjects and general skills are the micros used in your school?

10. Are microcomputers used for information handling *purposes? If so, in what way?*

11. Are microcomputers used for games? If so, what types?

12. Are you already part of, or do you intend to join, the Times Network for Schools, Doomsday, or any other local or national network? Please state details:

13. How would you like to see microcomputers used most in the future? As:

DATABASES		MACHINES WITH WHICH TO LEARN PROGRAMMING	
CAL		JUST ANOTHER LEARNING AID	
OTHER (please list)			

14. What financial assistance, and from whom, do you receive for the following areas in relation to microcomputers?

HARDWARE PURCHASE		SOFTWARE PURCHASE	
RUNNING COSTS		TRAINING FOR TEACHERS	
OTHER			

15. To what extent have microcomputers led to any rethinking of the curriculum?

16. Is the school library involved with micros? If so, how? Please comment on how you envisage their future use in libraries?

17. Do you co-operate with other schools at different levels who either provide or take your pupils, in terms of microcomputer hardware/software, etc.

18. Have you noticed any difference in interest and use between boys and girls in terms of microcomputers across the curriculum?

19. If you have any additional comments, please insert them here. If you would be willing to answer further questions at some future time, please put a tick in the box. ☐